

# Designing a Habitat

## Objective

Students will identify the different parts of an aquatic habitat that most aquatic animals need to survive.

## Curricular Areas

Social Science (importance of the students' homes and neighborhoods); Language Arts (creation of a class list); Science (components of a habitat)

## California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1<sup>st</sup>**–Life 2, Investigation 4; **2<sup>nd</sup>**–Life 2, Earth 3, Investigation 4

Social Science: **K**–4; **1<sup>st</sup>**–1.2, 1.5; **2<sup>nd</sup>**–2.2, 2.4

Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1<sup>st</sup>**–Writing 1.0, Written/Oral 1.0, Listening 1.0, 2.0; **2<sup>nd</sup>**–Written/Oral 1.0, Listening 1.0, 2.0

## Method

Students will design and build an aquatic habitat either as a two-dimensional display or in the form of a simple aquarium.

## Materials

*For a display:*

- Use felt board with components (gravel, plants, fish) drawn by students
- White construction paper, crayons, scissors, glue, and felt pieces
- Or students may draw and color an aquarium

*For a simple Aquarium:*

- A large glass or see-through plastic container or fish bowl
- Gravel, small plants (may be replicas), water, fish, and fish food

NOTE: Project WILD Aquatic Guide, page 229 provides a simple guide for educators keeping a classroom aquarium.

## Background

An aquarium is an artificial habitat. However it provides the life-giving conditions of food, water, shelter, air, and space in a suitable arrangement for animals to survive. In the aquarium, water is a uniquely sensitive part

of the habitat. A simple aquarium is an effective way for students to learn that animals need food, space, shelter and water in order to survive. For animals this environment is called a “habitat.”

A habitat is more than a house, it is like a neighborhood. People live in many different types of houses and neighborhoods. Animals live in many different types of habitats. Some animals live in a grove of trees, in backyard bushes, underground tunnels or in the water. There are also different types of water habitats. Some aquatic animals need fresh water as in lakes, streams or rivers. Others need salt water that is found in oceans.

## Procedure

1. To begin, have students close their eyes and picture the houses in their neighborhood. Ask students to picture their own home. Ask them questions, such as: “How does your home help you? What do you have in your house that helps keep your food cold? How do you stay cool in the summer and warm in the winter? How and where do you get water?”
2. Have students open their eyes and share what they saw.  
\*For ESL and ELL learners it is important to have pictures of appliances and different types of homes. Write the words from the sharing on the board or a piece of paper.
3. Define habitat and start a discussion about habitats.  
\*For the ESL and ELL learners provide pictures of different types of habitat. Focus on different water habitats such as rivers, streams, lakes, ponds, and oceans.
4. Explain that the class is going to make an aquatic habitat. Ask the students what a fish needs in order to live.

*For a class aquarium:* show students the different elements for the aquarium and ask what they provide for the fish.

*For a class felt board display:* have students draw the elements; color, cut and glue felt on the backside.

\*The container provides space; the plant provides shelter (gravel anchors the plant).

5. Have the students help assemble the class aquarium or the felt board.

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6. When the aquarium is completed, review the terms habitat, shelter, space, food, air and water. Create a list of the aquarium components and designate if it provides shelter, food, water, or space for the fish. Ask the type of water in the aquarium: fresh or salt.

## Extensions

- 1 Have the class visit a large aquarium.
- 2 Discuss what types of animals live in salt water and fresh water.
- 3 Have students keep a daily journal on the activities in the aquarium (either by drawing

pictures or writing one or two sentences depending on the age group).

## Evaluation

- Have the students name the five elements needed to sustain life.
- Ask the students to choose an aquatic animal and tell or draw where it lives (fresh water or salt) and what it needs to survive.
- Have students draw pictures of the sequence of steps in making the aquarium habitat.

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# Keeping Classroom Aquaria: A Simple Guide for Educators

There are many resource books available on the topic of keeping aquaria. These books provide a great deal of detailed information on aquaria of many different types including tropical freshwater, temperate freshwater and marine aquaria. Many specialized aquaria require equally specialized equipment and a lot of care and attention to keep the animals and plants in them healthy. Most educators have neither the time nor the resources to do this but may want to maintain a simple aquarium. Some will want to use an aquarium as an object of interest and as a catalyst for classroom activities.

The following procedures are a very simple way to start a freshwater aquarium. It is suitable for the many species of hardy fish that are widely sold in pet shops. If educators or students are bitten by the “aquarium bug,” a more detailed book will be necessary for additional guidance.

Some people will have ethical objections to keeping a classroom aquarium. Whether it is, or is not appropriate to keep plants and animals in a classroom aquarium for instructional purposes will be left to individual educators and students to decide. If educators do decide that a classroom aquarium is appropriate, these procedures will help ensure that it is a healthy medium within which the plants and animals can live.

## Equipment

The following items will be needed to start an aquarium.

***A glass fish tank:*** The size will depend upon the number of fish you want to keep. A five- to 10-gallon tank (19 to 38 liters) is recommended as a beginning size; however, this size will only hold a few fish. An aquarium can safely support about one inch of fish per gallon of water (10 inches of fish in a 10 gallon aquarium).

***Aquarium sand and/or gravel:*** This item can be purchased in a pet shop. Natural sand, especially from a seashore or lakeside beach, will have to be

carefully washed before use in your tank. It is easier to buy pre-washed sand or gravel. Natural sand may also introduce unwanted organisms. A ratio of one pound of gravel for every gallon of water is recommended.

***An air pump with plastic tubing:*** Tygon is a high-quality plastic tubing.

***An air stone:*** This device is a porous, stone-like block of material that attaches to the end of the tubing and forces the air from the pump to spread into many small streams of bubbles.

***A water-filter system:*** Many pumps are attached to a filter of some kind. Some filters hang outside the tank. Others are built into a plastic grid that is placed below the sand and gravel in the bottom of the tank. Sub-sand filters are often cheaper and are suitable for a general-purpose tank with a small number of fish or small animals.

***Nylon wool (glass wool) and charcoal granules***

***Foil wrap (aluminum cooking foil)***

***Reagent grade salt:*** This is non-iodized or natural sea salt.

***A few crystals of potassium permanganate:*** This chemical is available in many drug stores and is often found in school science storerooms.

***An aquarium hood or cover:*** This item is necessary to keep fish from jumping out. Many hoods have built-in lights. Check standard hood sizes before constructing your own aquarium.

***Dried fish food***

***An aquarium heater:*** This equipment is optional for certain conditions.

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## Constructing a Glass tank

The funds to buy even a small, professionally made fish tank simply may not be available. You can make your own tanks if you want to save money. If so, you will need the following:

**Five pieces of glass:** One piece is needed for the bottom and four pieces are needed for the sides (see Diagram A). You can get these at a hardware store or glass shop. Staff will cut them from glass of the weight (thickness) you desire. Bigger tanks should be made from heavier glass, but normal window-grade glass is

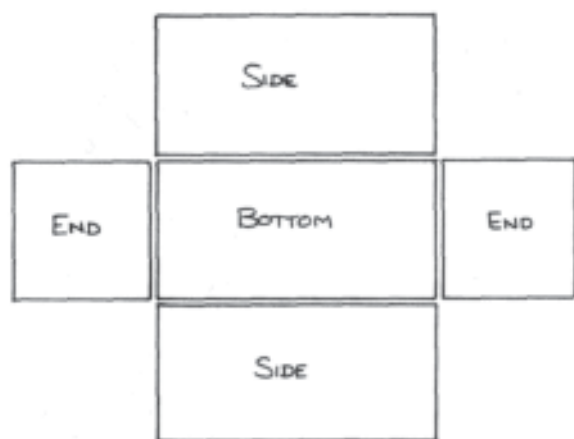


Diagram A

suitable for five-gallon tanks. Have the glass shop polish all the edges of the glass pieces on their machines so that they are smooth and square. Ask them not to bevel the polished edges. Once you have the glass pieces, you are ready for the next step.

**Aquarium sealant:** Aquarium sealant is a glue for sticking pieces of glass together. It is usually a high-quality silicone sealant. Do not use ordinary silicone sealant for the aquarium because it contains a compound that is toxic to fish and other animals. The tube will say “aquarium sealant” on it. Most aquarium supply shops sell this material. Squeeze a wide line of the sealant out of the tube around the perimeter of the piece you are going to use for the bottom of your tank. Squeeze a line of the sealant around three sides of two of the other side pieces. Stand them up on top of the bottom piece so that their edges overlap at the corners. Repeat the process with the two other side

pieces. The tank will now be formed from the bottom and the four sides. Make sure the sides are square at the corners and perpendicular to the bottom. Leave the tank where it was assembled until the sealant dries. Note that the sealant always stays somewhat



Diagram B

soft or rubbery. This drying process will take 12 to 24 hours. Following the first drying period, go around the inside corners and the entire bottom inside where the sides join the bottom piece with another good line of sealant. Let it dry for an additional 24 to 48 hours. Fill your new tank with water and let it stand to test that it is leak proof and that the sealant is secure.

NOTE: Diagram B is a detail of the corners, showing the fit of the glass and sealant. The end pieces will have to be shorter by two times the thickness of the side pieces of glass so that they will all fit inside the perimeter of the bottom.

**CAUTION: Water is heavy! It is never a good idea to try to carry even a small aquarium while it is filled with water.**

## Preparation of Tank for Animals

Once you have a tank and the other items mentioned above follow these steps to get it ready for the fish or other animals.

**Step 1.** Set up the tank where it is not in direct sunlight. You may use a 25-watt bulb in a normal lamp for light if your room has little natural light.

**Step 2.** Put your aquarium sand in a bucket and wash it with hot tap water. Swirl the water with the sand and pour off the water and any fine debris. Repeat this process until the wash water is clear. New sand is usually dusty, and this process removes the dust.

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**Step 3.** If you are using a sub-sand filter, you should place it on the tank bottom before you add the sand. Pour the sand into the bottom of the tank and smooth it until it covers the bottom.

**Step 4.** Cover the sand with a sheet of the aluminum foil wrap. Slowly add hot tap water. The foil prevents the sand from being stirred up as you pour in the water, but pour quite slowly and gently. Once the water cools, remove the aluminum foil wrap.

**Step 5.** Add a teaspoon of the plain salt (noniodized). Add a few crystals of potassium permanganate. This step helps to maintain the chemical balance of the tank water. Instead of potassium permanganate, you can use some dechlorinator available from pet stores; use according to instructions provided at time of purchase.

**Step 6.** Set up your air pump, tubing and air stone. If you are using a filter that hangs outside the tank or that is attached to the air pump, set it up now as well. (The charcoal and glass wool are for the pump.) If you are using a sub-sand filter, attach the tubing from the pump to the tube coming up from the sub-sand filter. (The booklets that come with the filters or pumps usually will explain this arrangement.) Once your pump and filter are working and air is bubbling, let the system “age” for at least two days. Five days is better. Aging means letting the equipment operate with no fish or plants in the water.

**Step 7.** Add plants that are floating or the type that are planted in the sand. Make sure your hands are clean before you plant the bottom plants. Rinse your hands well to get rid of any traces of hand soap, hand lotion, etc. Be sure the plants are healthy before adding any animals.

**Step 8.** You are now almost ready to add the fish or other animals. Before adding the fish to the tank, float the bags containing the fish or other animals and the water from the pond or shop where you obtained them on the surface of your tank for one to two hours before opening them. This process allows the water from the pond or shop to come to the same temperature as that in your tank and reduces any stress to the animals. Add one-half cup of aquarium water to the bag of fish every 15 minutes for 45 minutes to an hour before adding any fish to the aquarium water. Begin by adding no more than two fish to the aquarium or else some poisons may develop, killing the fish. Wait from

three to five days before adding any more fish.

**Step 9.** You may need a tank heater if you want to keep tropical freshwater fish, or if your tank gets cold because your school heat is turned off on weekends or overnight. Heaters for small tanks are fairly inexpensive and have built-in thermostats to maintain the temperature. They come with instructions. You may want to set up the thermostat during Step 6 above. Install an aquarium thermometer to monitor and maintain recommended water temperature.

**Step 10.** Once the fish are in the tank and the aquarium is balanced, you should never have to change all the water. Every month, remove and replace 25 percent of the water. Remember that the water you use to replace the aquarium water should be “aged”. Keep a supply of water that has been taken from the tap hot and then allowed to stand for two days in a clean bottle, with salt and permanganate crystals or dechlorinator added. If aquarium water is heated, add replacement water slowly to avoid shocking fish with cold water.

### ***Feeding***

Feed the fish lightly once each day. Do not feed more than the fish can eat in two or three minutes. Feeding on weekends may not be necessary. Never leave quantities of decaying food or any vegetable matter (dead plants, etc.) in the tank. Make or purchase a siphon and “vacuum” your tank with it. If you are away for a long time, you can buy slow feeding tablets from pet supply shops. Make friends with the school custodians because they will often look after your tank on holidays. Some animals such as frogs, salamanders, dragonfly nymphs and diving beetles require live food. Brine shrimp are good sources. You can set up and keep a brine shrimp colony in the classroom. You can also buy live brine shrimp in many aquarium-supply shops.

### ***Disease***

There are many diseases that afflict aquarium fish but the two most common are fungus and ich. Fungus occurs after an injury or loss of the fish’s protective mucous coating and appears on the fish as white, cotton-like patches. Ich usually occurs after a period of stress and looks like small grains of salt on the fish. Consult a pet shop for proper medications.

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**Special Purpose Tanks and Aquaria**

Aquaria can take many forms and shapes. You can make small aquaria from gallon jugs if they have clear glass. You can use a two-hole stopper on top so that the tube from an air pump can be let into the neck of the bottle. You will have to use a small air stone so that it can be slipped through the narrow neck into the bottle. If you have a special jar cutter (a tool for scribing around glass jars so that they can be cut to remove the neck), you can make a number of cylindrical tanks from scrap bottle jugs. Be careful to avoid cutting yourself. Some local glass shops will do this job for you. Always have the newly cut surfaces polished because a freshly cut glass surface is very sharp.

You can use aquarium sealant and small pieces of glass to make mini-aquaria of special shapes so that you or the students can photograph fish and pond animals in a

thin “sandwich” of water. Otherwise, the thickness of water in a normal tank allows the animal to turn away from the camera or to swim out of view, especially in close-ups. You can also adjust the lights on small tanks to get well-lighted photos. If you are studying special behaviors (e.g., egg laying or predation), then small, narrow tanks are often best.

Often small aquaria and small animals are more useful for examination and observation than are big tanks, but big tanks can serve as long-term classroom learning centers by providing the focus for many instructional activities, including creative writing, drawing, painting, poetry, reading and research, as well as science and mathematics activities.

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